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ORIGINAL

SOMATOTYPE AND DIGITAL DERMATOGLYPHIC IN MEXICAN FOOTBALL PLAYERS

DERMATOGLIFIA DACTILAR Y SOMATOTIPO EN FUTBOLISTAS MEXICANOS

Juárez-Toledo, L.¹; Domínguez-García, M.V.²; Laguna-Camacho, A.³;
Sotomayor-Serrano, N.⁴ & Balbás-Lara, F.⁵

¹ Master in Health Sciences. Facultad de Medicina. Universidad Autónoma del Estado de México. Toluca (México). lauraplm13@hotmail.com, lauraplm13@hotmail.com

² Science Doctor. Centro de Investigación en Ciencias Médicas, Universidad Autónoma del Estado de México, Toluca (México). mavidoga@yahoo.com.mx

³ PhD in Psychology. Centro de Investigación en Ciencias Médicas, Universidad Autónoma del Estado de México, Toluca (México). alagunaca@uaemex.mx

⁴ Master in Education. Facultad de Medicina. Universidad Autónoma del Estado de México. Toluca (México) nancyanagely@gmail.com

⁵ Medicine Doctor. Universidad Autónoma del Estado de México. Toluca (México). Email: mephisto_1021@hotmail.com

Spanish- English translator: Juárez-Toledo, L., lauraplm13@hotmail.com & Domínguez-García, M.V., mavidoga@yahoo.com.mx

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ABSTRACT

Evaluating body shape and capacities is needed for selection, classification and training of football players. The present study examined in Mexican male football players (N = 49) the relationship between types of somatotype and types of physical capacities according to digital dermatoglyphics. The frequencies of types of somatotype and of physical capacities were compared between football players subgroups. A higher proportion of football players was characterised by a balanced mesomorph somatotype with dermatoglyphic type 2 and 3 corresponding to strength, explosive strength and velocity. This is consistent with previous findings in Chilean and Brazilian footballers, Therefore extending the available evidence of somatotype and dermatoglyphics in Latin American football players.

KEYWORDS: somatotype, digital dermatoglyphics, performance, football

RESUMEN

La valoración de la forma corporal y de las capacidades físicas es una necesidad para la selección, clasificación y entrenamiento de los jugadores de fútbol. El presente estudio examinó en futbolistas profesionales mexicanos (N = 49) la relación entre clases de somatotipo y clases de capacidades físicas de acuerdo a dermatoglifia dactilar. Las frecuencias de clases de somatotipo y clases de capacidad física fueron comparadas entre subgrupos de futbolistas. Una mayor proporción de futbolistas se caracterizó por somatotipo mesomorfo balanceado con dermatoglifia tipo 2 y 3 correspondiente a fuerza, fuerza explosiva y velocidad. Esto es consistente con hallazgos previos en futbolistas chilenos y brasileños, extendiendo por tanto la evidencia disponible acerca de somatotipo y dermatoglifia en futbolistas latinoamericanos.

PALABRAS CLAVE: somatotipo, dermatoglifia dactilar, rendimiento, fútbol.

INTRODUCTION

Soccer is the most popular sport in the world. Historically it has been found that various civilizations have played some proto-soccer, or ball game (Giulianotti, 2012). In many modern societies, football goes beyond a sports game, having this great incorporation into a culture. The activity related to soccer is therefore very dynamic (Rosique and Roa, 2007). In recent decades, for example, the number of football sports clubs, amateurs, and people interested in being a footballer has grown significantly (Magaz-González, Mallo-Fernández, and Fanjul-Suárez, 2017). As a result of, football competition is also increasing.

The physical performance of the players has been a factor of great interest to be a determinant of competitive success for both the player and the team (Reep

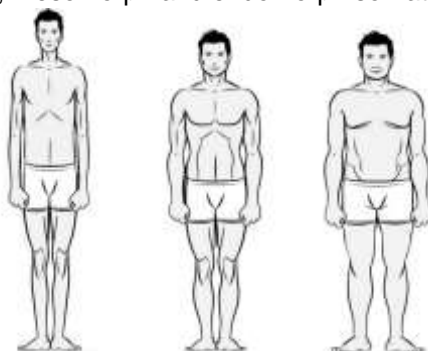
and Benjamin, 1968, Mackenzie and Cushion, 2013, Plumley, Wilson and Ramchandani, 2017). There are some scientific methods for assessing physical performance (Ali, 2011). However, only a minority of sports centers have laboratories or equipment for sophisticated assessments. Therefore, more available methods are needed to assess the physical abilities of the soccer players.

The present work considered two simple and complimentary evaluations of physical qualities of soccer players. The first evaluation is the somatotype, of which several studies have been carried out relating body shape to physical performance in soccer players (Rienzi and Mazza 1988, Carter et al. 1998, Reilly, Bangsbo and Franks 2000). The second assessment is that of physical ability through finger dermatoglyphics (Cummins and Midlo, 1942), which has been less studied in soccer players.

A common method for classifying body shape and its composition is the somatotype of Heath and Carter (1967) who proposed three main classes: the endomorphic indicating a tendency towards adiposity, the mesomorphic signaling muscular predominance and the ectomorphic one characterized by thinness (Figure 1).

The International Society for the Advancement of Cineanthropometry (ISAK) postulates that somatotype is a reliable method that associates certain somatotypes with sports modalities and levels of competence (ISAK, 2001). It has been observed that Mexican university and professional soccer players are characterized by a balanced mesomorphic somatotype, in which there is no tendency to ectomorphy or endomorphy (Rodríguez Gutiérrez and Echevoyen Monroy, 2005; Rivera Sosa, 2006). The same type of balanced mesomorphic somatotype has been found in male Brazilian and Chilean professional soccer players (Castanhede, Dantas and Fernandes Filho, 2003; Jorquera Aguilera, Rodríguez Rodríguez, Torrealba Vieira et al., 2013). This indicates, in general, a body shape with muscular predominance in Latin American soccer players.

Figure 1. Ectomorph, mesomorph and endomorph somatotypes, respectively



Somatotype and constitutional psychology

(Available on https://en.wikipedia.org/wiki/Somatotype_and_constitutional_psychology.

Acceded on March 29th, 2017)

Dermatoglyphics, on the other hand, is based on finger patterns on fingerprints, which functions as a genetic marker associated with certain personality traits or qualities (Cummis and Midlo, 1926), including physical abilities. Finger or dermatoglyphic lines are classified as arch, loop, and whorl (Figure 2). The arc is characterized by more or less parallel papillary lines from one end to the other. The clip has lines with a delta or central confluence point of lines that curve to the point of origin. The whorl is two or more deltas that result in a circular, elliptical, helical, among others. Three physical capacities have been identified according to the predominant dermatoglyphic typology: the arch is related to physical strength, the fastening with speed and the whorl with motor coordination. The total of lines is also related to resistance and the total of deltas with motor coordination.

Figure 2. Finger dermatoglyphics



(Hernández C, Ibarra J, Retamales Muñoz y col, 2013)

Finger dermatoglyphics has been associated with physical abilities classes (Abramova, Nikitina and Ozolín, 1995; Del Vecchio, Gonçalves, 2010). Previous studies have found in Chilean and Brazilian soccer players a greater prevalence of dermatoglyphics for strength and speed (Castanhede, Dantas and Fernandes Filho, 2003; Hernández, Ibarra, Retamales et al., 2013).

Objective

The aim of the present study was to examine the relationship between body configuration and physical abilities of Mexican professional soccer players through somatotype and finger dermatoglyphics. The hypothesis was that there would possibly be a concordance of the balanced mesomorph somatotype previously found in football players; however, the predominant type of dermatoglyphics dependent on the genetic component could vary from that found in footballers from other ethnic groups.

MATERIAL AND METHODS

Subjects

The study included 49 professional male players from the second and third soccer divisions belonging to the Potros team of the Autonomous University of

the State of Mexico, in the City of Toluca, Mexico. The study was carried out following the ethical principles of the Declaration of Helsinki (2016). The players received information about the study and gave their signed consent to participate.

Procedures and Measurements

The participants had three sessions. In the first meeting, participants gave us general information about age and playing the position. We measured their weight, body fat and height. In session 2, anthropometric assessments were performed to determine the somatotype. In session 3, a dermatoglyph assessment was performed.

Somatotype. The percentage of fat mass and the weight in kilograms were measured in a monitor with bio-impedance adapted with force transducers (Inbody 720 ®). Height in centimeters was measured with a wall stadiometer (accuracy 1.0 mm; Seca ®). The circumference of the arm (flexed and tensioned), waist, thigh, and the calf was measured using an anthropometric tape of fiberglass (precision 1.0 mm; Vitamex ®). Hummer and femur diameters were measured with a short branch anthropometer (0.5 mm accuracy; Harpenden ®). The triceps, subscapular, supraspinal, supriliac, muscular and calf folds were taken with a professional plicometer. With the anthropometric data of each participant, the somatotype class was calculated according to the method suggested by ISAK (2001).

Dermatoglyphia. The traces of the ten fingers of both hands were collected using a digital reader (digitalPersona U.are.U 4500). To obtain each fingerprint, place your finger in the center of the reader and roll your finger to the right side and then to the left side until you get the print. The evaluation of the dermatoglyphic of each player obtained through the method described by Cummis and Midlo (1942) and the classification of the type of physical activity was based on the proposal of Fernandes Filho (2010).

Data analysis. Frequency or proportion of each type of somatotype was counted in the total group and by playing the position, and of each type of physical characteristic according to dermatoglyphics. The frequencies of the somatotype and dermatoglyphic classes were then compared between subgroups using chi-square test. The analyses were performed in SPSS software version 22.

RESULTS

Participating players averaged 20 years of age, with healthy levels of body fat and weight (Table 1).

Table 1. Characteristics of the players (N = 49). m: Medium; SD: Standard deviation.

	M ± DE
Age (years)	20,0 ± 3,1
Weight (Kg)	69,7 ± 8,6
Height (cm)	175,2 ± 5,9
Body mass index (kg/m ²)	22,6 ± 2,0
% Fat (Inbody)	14,4 ± 3,5
% Fat (plicometry)	13,9 ± 3,2

The somatotype class found most frequently among the participating players was that of a balanced mesomorph with about 50% of the players in all positions (Table 2). The frequency of other types of somatotypes, in general, was not greater than 10%. Measurements for the determination of such somatotypes are given in Annex 1.

Table 2. Somatotype classes in participating players: total and per game position (%)

Somatotype class	Total N=49	Forward n=15	Midfielder n=15	Defense n=15	Goalkeeper n=4
Balanced Mesomorph	57,1	53,3	66,6	46,6	75,0
Meso-ectomorph	6,1	6,6	6,6	6,6	0,0
Ectomorph-mesomorph	8,1	13,3	6,6	6,6	0,0
Ecto-mesomorph	2,0	6,6	0,0	0,0	0,0
Balanced endomorph	2,0	0,0	0,0	6,6	0,0
Endo-mesomorph	4,0	6,6	6,6	0,0	0,0
Mesomorphic endomorph	6,1	6,6	6,6	6,6	0,0
Meso-endomorph	6,1	6,6	0,0	13,3	0,0
Central	8,1	0,0	6,6	13,3	25,0

With regard to the classification of physical abilities, according to the finger dermatoglyphics presented in Annex 2, it was found in the participating players that the most common in general were type 2 corresponding to strength, explosive force and velocity, type 3 corresponding to explosive force and velocity, and type 5 corresponding to coordination and resistance (Table 3). The kind of dermatoglyphics less found was typed 4 corresponding to agility, coordination, and resistance.

Tabla 3. Finger dermatoglyphics in participating players: total and per game position (%)

Class of dermatoglyphics	Total N=49	Forward n=15	Miedlefielder n=15	Defense n=15	Goalkeeper n=4
1. Force					
2. Force, explosive force, velocity	8,1	13,3	0,0	6,6	25,0
3. Explosive force, velocity	32,6	26,6	40,0	33,3	25,0
4. Agility, coordination and endurance	4,0	6,6	6,6	0,0	0,0
5. Coordination and resistance	22,4	26,6	26,6	20,0	0,0

To study the relationship of somatotype and dermatoglyphic classes, the group was divided according to whether or not they had a balanced mesomorphic somatotype since this was the most common somatotype in the group. It was found that soccer players with balanced mesomorphic somatotype had a higher prevalence of class 2 and 3 dermatoglyphics corresponding to strength, explosive strength and velocity than players with another somatotype class (Table 4). In contrast, players who did not have a balanced mesomorphic somatotype had a greater presence of type 1, 2 and 5 dermatoglyphics corresponding to strength, agility, coordination, and resistance (Table 4).

Table 4. Description by somatotype and dermatoglyphic classes of soccer players

Class of dermatoglyphics	Balanced Mesomorph n=28	Others somatotypes n=21	χ^2	<i>p</i>
1. Force	0,0	19,0	14,3	0,01
2. Force, explosive force, velocity	53,5	4,7	24,4	0,01
3. Explosive force, velocity	42,8	19,0	5,1	0,02
4. Agility, coordination and endurance	0,0	9,5	6,4	0,01
5. Coordination and resistance	3,5	47,6	24,9	0,01

DISCUSSION

The present study examined in Mexican soccer players the relationship between body shape or somatotype and types of sports abilities based on dermatoglyphics. It was found that the most common somatotype was the balanced mesomorph with dermatoglyphics corresponding to explosive force and velocity. In players with other somatotypes, the dermatoglyphics corresponding to coordination and resistance excelled.

In line with previous research, this study found that the most common somatotype in soccer players was the balanced mesomorphic (Castanhede, Dantas and Fernandes Filho, 2003; Rodríguez Gutiérrez and Echegoyen Monroy, 2005; Rivera Sosa, 2006; Jorquera Aguilera, Rodríguez Rodríguez,

Torrealba Vieira et al., 2013). Moreover, in line with what was found in Chilean and Brazilian soccer players, the most common dermatoglyphics in Mexican soccer players in this study were those related to explosive strength and speed (Castanhede, Dantas and Fernandes Filho, 2003; Jorquera Aguilera, Rodríguez Rodríguez, Torrealba Vieira et al., 2013).

Therefore, the evaluation of the somatotype and the dermatoglyphics of soccer players could provide information about their physical dimensions and physical abilities, which could potentially be relevant to facilitate the selection, classification, and training of soccer players.

There are still few studies in this area. Therefore, more research is needed to substantiate the available findings and increase the evidence. The observations of this study are however novel as they distinguish the most prevalent abilities of Mexican male soccer players according to their somatotype and finger dermatoglyphics, which had not been investigated previously.

CONCLUSION

It was found that these Mexican soccer players, regardless of the game position, had balanced mesomorphic somatotype and their finger dermatoglyphics corresponded to explosive force and speed.

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Annex 1. Standard averages and deviations for measurements of skinfolds, circumferences, body fat and somatotype characteristics

	Total N=49	Forward n=15	Miedlefielder n=15	Defense n=15	Goalkeeper n=4
Cutaneous Folds (mm)					
Triceps	8,1±2,0	8,0±2,2	7,9±1,7	8,7±2,3	7,9±1,2
Subscapular	9,7±2,8	8,9±3,2	9,7±2,9	10,4±2,5	9,2±1,3
Bicipital	3,8±0,8	3,9±0,8	3,6±0,7	4,0±1,1	3,4±0,5
Pectoral	7,2±2,8	6,7±3,1	7,3±2,7	7,8±2,9	5,8±0,6
Axillary	7,7±2,5	7,6±3,0	7,7±2,1	8,2±2,8	6,4±0,6
Iliac crest	13,5±4,9	13,2±5,3	13,7±4,1	14,6±5,6	10,4±2,9
Suprailiac	9,0±4,1	7,9±2,6	9,5±4,6	9,8±5,2	8,0±1,4
Abdominal	15,2±5,2	14,2±5,5	16,3±5,4	16,4±5,0	10,8±2,6
Thigh	8,2±2,0	8,3±1,1	7,8±2,0	8,3±2,7	8,8±1,7
Calf	5,3±1,5	5,6±1,9	5,3±1,4	5,0±1,2	5,5±1,0
Circumference (cm)					
Relaxed arm	29,3±2,3	28,9±3,3	29,2±1,6	29,3±1,6	30,7±1,7
Flexed arm	31,0±2,5	31,0±2,6	31,0±3,1	31,2±1,2	33,8±2,3
Waist	77,4±4,6	75,0±4,6	77,9±4,9	79,3±4,1	77,5±1,4
Hip	91,6±5,8	86,7±6,1	92,5±3,4	93,7±3,9	98,9±2,6
Thigh	51,7±5,0	50,1±4,0	52,8±2,7	53,2±2,2	47,1±14,9
Calf	35,7±1,8	35,1±2,3	35,7±1,6	36,2±1,5	36,7±1,8
Percent body fat (plicometry)					
Endomorph	2,7±0,9	2,7±1,1	2,6±0,9	2,9±1,0	2,4±0,2
Mesomorph	4,4±0,8	4,4±0,9	4,4±0,8	4,3±0,9	4,5±1,0
Ectomorph	2,6±0,8	2,8±1,0	2,5±0,6	2,5±0,6	2,8±0,4

Annex 2. Standard averages and deviations for counts of type dermatoglyphics in all players and per game position

	Total N=49	Forward n=15	Miedlefielder n=15	Defense n=15	Goalkeeper n=4
Arco	0,6±1,6	0,9±2,1	0,3±0,6	0,6±1,3	1,3±2,5
Presilla	6,0±3,3	5,7±2,9	5,7±3,5	6,5±3,6	7,0±2,5
Verticilo	4,1±4,3	3,9±4,0	5,0±4,7	3,9±4,6	1,8±1,5
Deltas (D10)	12,4±4,3	11,9±4,9	13,3±3,9	12,4±4,4	10,5±3,3
Crestas (SCTL10)	120,3±38,2	115,6±48,8	128,8±29,4	119,7±36,7	108,9±34,8